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## Control Material CS-M-3

### As, Cd, Cr, Cu, Hg, Pb, Se and Zn in Dried Mushroom Powder (*Boletus edulis*)

#### General Information

Intended use: Checking the performance of analytical laboratories engaged in the determination of As, Cd, Cr, Cu, Hg, Pb, Se and Zn in food and other biological samples

#### Produced and certified by:

Institute of Nuclear Chemistry  
and Technology, Dorodna 16  
03-195 Warsaw, Poland

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#### Description of material

Wild mushrooms (*Boletus edulis*) were collected in the forest in north-west Poland, cleaned, i.e. dust, soil and attached mosses were removed. The end part of stalks was cut off using stainless steel knife. Mushrooms were cut to smaller parts, which were then air dried at a temperature 25 – 60°C according to standard procedure used by food concentrate producers. Dried mushrooms (caps and stalks) were milled in a centrifugal mill made of stainless steel and sieved by stainless sieves. The fraction of particles with diameter  $\leq 0.3$  mm was collected. The obtained material was further homogenized by mixing in a plastic drum rotated in three directions, distributed into PET bottles in portion of ca. 20 g and firmly covered. Care was taken to avoid contamination. The material was then sterilized by electron beam radiation from linear accelerator with dose of 28 kGy. Homogeneity was examined for the sample size of 250 mg for each of element certified i.e. As, Cr, Cd, Cu, Hg, Pb, Se and Zn. Statistical evaluation has been performed following ISO 13528:2005 standard [1] recommendations confirming good homogeneity of the material for sample masses  $\geq 250$  mg.

#### Determination of moisture content

The concentration of elements should be expressed on a dry-weight basis. Moisture content should be determined on a separate subsample by drying in an oven at 50°C for 24 hours.

#### Assigning of reference values

Reference values were assigned on the basis of the results provided by several reference laboratories. The elements have to be determined by at least two methods in order to assign reference value. The results were obtained AAS, ICP-MS and NAA. A reference value was



calculated as the robust mean value [1] of the laboratory means, an uncertainty was evaluated according to ISO 13528:2005 [1], ISO GUM [2] and IUPAC harmonized protocol [3].

### Reference values for Mushroom Powder

Element	Reference value + expanded uncertainty (k=2)
	$X_{ref} \pm U$ [mg · kg <sup>-1</sup> dry mass]
As	0.651 ± 0.026
Cd	1.229 ± 0.110
Cr	5.79 ± 0.80
Cu	18.73 ± 0.70
Hg	2.849 ± 0.104
Pb	1.863 ± 0.108
Se	17.43 ± 1.36
Zn	113.30 ± 3.28

The material is stored in an air conditioned room, in which the temperature does not exceed 22°C. Its stability is monitored at appropriate time intervals.

Long-time stability is monitored during storage. The shelf life of the control mushroom powder material has been established to be **31 December 2025**.

The users should store the material at room temperature [(20±5)°C] in tightly closed original containers.

### References

1. ISO 13528:2005 Statistical methods for the use in proficiency testing by interlaboratory comparison, Geneva, 2005
2. International Organization for Standardization (ISO), Guide to the Expression of Uncertainty in Measurement, ISO, Geneva, 1993 (corrected and reprinted 1995)
3. M. Thompson, S.L.R. Ellison, R. Wood, The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories (IUPAC Technical Report), Pure Appl. Chem., 78 (2006) 145

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### Reference laboratories

Faculty of Chemistry, Warsaw University  
Institute of Agricultural and Food Biotechnology, Warsaw  
Institute of Nuclear Chemistry and Technology, Warsaw